



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/706,968	11/14/2003	Jeffrey T. Wetzel	244051US6YA	7489
22850	7590	02/09/2006	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			DOAN, THERESA T	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 02/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/706,968

Applicant(s)

WETZEL ET AL

Examiner

Theresa T. Doan

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-40 is/are pending in the application.
- 4a) Of the above claim(s) 23-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-19, 22 and 36-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Request for Continued Examination

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/22/05 has been entered. An action on the RCE follows.

Claim Objections

2. Claim 16 is objected to because of the following informalities:

The phrase of "...used as at least one of a lithographic structure for the formation of the interconnect structure, a hard mask, an anti-reflective coating, **and** a chemical mechanical polishing (CMP) stop layer" should be changed to "used as at least one of a lithographic structure for the formation of the interconnect structure, a hard mask, an anti-reflective coating, **or** a chemical mechanical polishing (CMP) stop layer".

Appropriate correction is required.

3. Claim 22 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is

required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 22 depends on claim 21, but claim 21 has been cancelled. Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 16-19, 22 and 36-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (6,284,149) in view of Gaillard et al. (U.S. Pat. 6,500,773) of record.

Regarding claim 16, Li (Figs. 6 and 18) discloses a process for forming an integrated circuit structure comprising: forming a layer of dielectric material (16,20) on a substrate 10 (column 7, lines 14-20); forming a hard mask layer 42 on the layer of dielectric material (column 7, lines 21-22); and forming a dual damascene structure for a metal interconnects (Fig. 6, column 8, lines 6-8), the dual damascene structure having a bottom opening 22 extending to a surface of the substrate 10, and a top opening 24 in communication with and wider than the bottom opening 22 and extending to the hard mask layer 42, wherein the hard mask layer 42 is etched to a width of the top opening 24 and used as at least one of a lithographic structure for the formation of the

interconnect structure, a hard mask, an anti-reflective coating, or a chemical mechanical polishing (CMP) stop layer (see Fig. 6).

Li does not disclose the hard mask layer 42 is made of TERA material.

However, Gaillard teaches an integrated circuit fabrication process having a layer of tunable etch resistant anti-reflective (TERA) material 404 as a hard-mask (figure 4E, column 8, lines 36-39 and column 6, lines 41-55) on the layer of dielectric material 402. Accordingly, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the process of Li by using TERA as a material for the hard-mask layer 42 because such a TERA layer would provide anti-reflective coating for DUV lithography, as taught by Gaillard (column 2, lines 10-11).

Regarding claims 17-18, Gaillard (Figs. 3D and 4D) further discloses a step of forming a layer of light-sensitive material (408/304) on the layer of TERA material (404/302), wherein the optical properties of the light-sensitive layer (408/304) and the TERA layer (404/302) are inherently substantially the same because both of the light-sensitive layer (408/304) and the TERA layer (404/302) have the same wavelength less than about 250nm (column 2, lines 13-24); and exposing the layer of light-sensitive material (408/304) to a pattern of radiation, wherein the forming the layer of TERA material (404/302) facilitates producing a pattern in the layer of light-sensitive material (408/304) substantially the same as the pattern of radiation; wherein the forming the layer of TERA material comprises providing a part of the lithographic structure for the

Art Unit: 2814

formation of a metal interconnect for the device structure (figures 3D and 4D, column 2, lines 8-28, column 8, lines 18-26 and column 9, lines 27-29).

Regarding claim 19, Gaillard discloses wherein the forming the layer of TERA material comprises depositing the layer of TERA material using at least one of plasma enhanced CVD (column 4, lines 34-35).

Regarding claim 22, Gaillard (Figs. 3D and 4D) discloses wherein the forming a damascene structure comprises integrating a tunable anti-reflective coating with a dual damascene structure formed using a method comprising at least one a via-first method, a full-via-first method, a full-via with no stop layer method, a trench-first method, and a buried via mask method.

Regarding claims 36-38, Gaillard (Fig. 4D) discloses a step of forming a damascene structure comprises using the layer of TERA material 404 as a hard mask, a sacrificial layer or a CMP stop layer for forming the top opening of the dual damascene structure.

Regarding claim 39, as discussed in claim 16 above, Li (Figs. 5-6) discloses the forming a dual damascene structure comprises first etching the hard mask layer 42 to the width of the bottom layer 22, and then etching the hard mask layer 42 to the width of the top layer 24 (column 7, lines 32-43).

Regarding claim 40, Gaillard (Fig. 5E) discloses a step of forming another layer of TERA material 504 in the layer of dielectric material (502,508); and etching the another layer to a width of the bottom opening.

Response to Arguments

Applicant's arguments with respect to claims 16-19, 22 and 36-40 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Theresa T. Doan whose telephone number is (571) 272-1704. The examiner can normally be reached on Monday to Friday from 7:00AM - 4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, WAEL FAHMY can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

Application/Control Number: 10/706,968

Page 7

Art Unit: 2814

you have questions on access to the Private PAIR system, contact the Electronic
Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Z. Han".

TD

January 24, 2006.